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BIOLOGICAL EVALUATION AT BULL MEADOW TIMBER SALE ON THE GOOSENEST RANGER DISTRICT, KLAMATH NATIONAL FOREST

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ABSTRACT

Two mixed conifer stands, typical of an estimated 500 acres of similar type, were examined for pest problems. Both stands had considerable standing and downed mortality concentrated in young dense aggregates of ponderosa pine. Top breakage and damage to much of the young pine was also prevalent. . Pests present in the stands included Armillaria root disease, Cytospora canker, Elytroderma needle disease, mountain pine beetle, and pine engraver beetle. None of these, however, was judged to be the primary cause of mortality. Rather, the underlying problem was overstocking that caused competition and stress and resulted in bark beetle attacks in combination with other less serious pests. The greatest opportunity for reducing future losses is through stocking control coupled with proper slash treatment.

INTRODUCTION

On December 2, 1980, John Pronos and John Dale from the Forest Pest Management Staff examined two stands within the Bull Meadow Timber Sale to identify pest problems. They were accompanied by Carl Jahnke-Leland who is using the stands for his Silvicultural Certification Examination.

OBSERVATIONS

Stand #1 was of the mixed conifer type with a predominance of ponderosa pine. Large stumps were scattered throughout the stand as a result of logging completed about 70 years ago. Three general age classes (175, 120,

and 70 years) of trees were present with most of the mortality in pine of the youngest class. This mortality was concentrated in the densest aggregates (>200 sq.ft./ac live stems) of sapling and pole size trees. Many of the dead trees were already down and appear to have died two or more years ago. A large proportion of the live understory ponderosa pine had unusually poor form and growth with frequent top defects, that could have resulted from snow, ice, wind, logging or animal damage. Groups of dead and downed trees were found throughout the stand and some had the appearance of root disease centers.

Stand #2 was similar to #1 in species composition and pattern of mortality; however, the pine was generally better in vigor and form. There was less overall mortality in this second stand, although one mortality group of 17 densely aggregated ponderosa pine (4-12" dbh) was visited. Most of these trees also had been dead for two years or more.

DISEASES

Armillaria mellea, a fungus that can cause a root disease, was found on dead tree roots within stand #1; however, after considering the characteristics of mortality groups and overall stand conditions, we concluded that this fungus was not a primary cause of tree death, but rather was invading roots after they died.

Two diseases were found in stand #2: cytospora canker, caused by Cytospora abietis, on white fir, and Elytroderma needle disease, caused by Elytroderma deformans, on ponderosa pine. Cytospora canker was causing branch mortality or flagging on scattered fir but was not at serious infection levels on any trees. The significance of this pest is that it usually occurs on trees that are under stress from factors including drought, insects, fire and other diseases such as dwarf mistletoe and root decay.

Elytroderma needle disease was affecting a few scattered small groups of ponderosa pine. Diagnosis of this problem involved recognizing small, compact witches brooms and dead one-year old needles on twigs. This disease rarely causes mortality, but can reduce growth. The several most severely affected pines in the stand had about one-half of their twigs infected. This level of infection can reduce tree vigor and predispose them to bark beetle attack.

(More detailed information on the two diseases in stand #2 can be found in Forest Pest Leaflets #42 and #146.)

INSECTS

Mountain pine beetle. Deterioration of the pine understory in stands such as the two examined is a frequent occurrence in northeastern California and the Inland Northwest. Mortality centers of the size seen are often associated with the activity of the mountain pine beetle, Dendroctonus ponderosae, and this was the apparent association in the two stands examined. The

absence of serious pathological problems within or near the mortality centers, of 1 to 17 trees, indicates that this insect is taking advantage of the overstocked understory and has become a primary biological factor associated with tree mortality. However, it does not contribute to the large amount of breakage seen in some of the centers. Continued formation of these mortality centers must be expected as long as the stands remain overstocked. A large buildup of beetle populations to produce more extensive mortality is not anticipated for 1981 as brood success was very low in the trees examined. This could change should additional stress, such as that from drought, be placed on the trees. Prescribed thinning to improve the residual tree and stand vigor would greatly reduce this potential.

Pine engraver beetles, Ips spp. Soon after breakage and mortality the green pine residues were infested by pine engravers. Fortunately, brood success has been very low, few attacks have occurred on standing trees, and topkills have been infrequent. Increased success is not anticipated under current climatic conditions, but any thinning within the groups of dense pine understory should be done from mid-July to December to avoid creating slash that will promote unacceptable population buildup. Proper slash treatment would further avoid conditions conducive to population increase.

BIOLOGY OF DAMAGING INSECTS

Mountain Pine Beetle. The mountain pine beetle, Dendroctonus ponderosae, presently is the most common bark beetle at the sites examined. Hosts present on the Goosenest RD include ponderosa, sugar and lodgepole pines. There is one generation per year in the Butte Valley Area. Adults attack trees and lay eggs from late June through August. The adults bore 2' to 4' long vertical egg galleries in the phloem/cambium region from bh to mid-crown, and lay eggs in niches along the sides of the gallery. A J-shaped hook is common at the lower 1-2 inches of the gallery. The hatching larvae feed in mines perpendicular to the main gallery, and construct small pupal cells at the end of these mines where they pupate and transform into adults.

Damage by the beetle is recognized by pitch tubes along the bole and red boring dust in bark crevices and on the ground. After successful attack, foliage becomes greenish yellow, then reddish brown within a short period. The beetle is often active and devasting in densely stocked stands of pole-sized trees - a description that aptly fits the problem understory of the stands examined.

Pine Engraver Beetles. Pine engravers produce I-, Y- or H-shaped gallery patterns in the inner bark of green host material. The galleries are kept clear by the adults and consequently the reddish boring dust piles up near the entrance holes. The dust is particularly visible on horizontal host material. In the Butte Valley Area two to three generations could be expected per year - two summer generations following spring emergence of adults and possibly a third that will overwinter as adults.

The factor primarily controlling beetle numbers is the presence of suitable host material. Therefore, management practices should provide the least possible quantity and quality of suitable material. This can be done by utilization, treating residues in such a way that the inner bark quickly desiccates, e.g. lop and scatter, chipping, burning. By proper disposal of logging slash and windthrown material, and maintenance of tree vigor through thinning, outbreaks in standing trees and top-killing can be minimized.

DISCUSSION

Neither stand had a single pest problem that was the direct or sole cause of mortality. The insects and diseases present indicated that the underlying problem was competition and stress within overstocked aggregates of mostly young ponderosa pine. Some of the mortality could be a result of drought stress during 1975-1977. No type of treatment, from clearcutting to thinning, should aggravate or incite any pest problems-assuming that the considerations listed below are followed. From a pest standpoint, there is no preferred stand treatment. Any reduction in basal area, together with removal of currently diseased or poorly growing trees, would improve stand health. Specific considerations if the stand is thinned include:

1. Lower the basal area of densest aggregates.

2. Discriminate against damaged trees and trees with poor form or growth, especially ponderosa pine.

3. Remove trees with Elytroderma infections in more than 50% of the crown.

4. Mimimize logging injury as much as possible.

5. Treat green pine slash to minimize the probability of subsequent pine mortality caused by engraver beetles.

Minimizing Pine Mortality Caused by Pine Engravers

Thinned, vigorous stands generally incur fewer engraver beetle attacks than overstocked stands of young pine, particularly during drought years. Unfortunately, recently thinned stands may temporarily be more attractive until the increase in tree vigor occurs, and the slash created in thinning may provide suitable material for a rapid increase in engraver populations. There are several approaches to greatly lessen the latter probability.

Thinning should occur from mid-July to December, with the optimum time of slash creation being August, September, and October. Slash created from December through the remainder of winter will maintain a "fresh" quality suitable for a rapid increase in the population surviving the winter. Creation of slash in the spring and into July further enhances the probability of undesirable population increases. However, it is not always

possible to avoid creating slash in the high risk months of December through June. When this occurs, several management practices can be used to help minimize the potential impact.

a. Dozer trampling of slash can be effective in reducing the volume of breeding material.

b. Chipping is very effective and especially useful in developed areas.

c. Slash can be burned, but any heat scorch to surrounding trees will make them more liable to insect attack.

d. Lopping and scattering the slash in stand openings will cause the slash to dry sufficiently to prevent completion of the insect life cycle.

e. When pine engraver populations increase enough in slash to constitute a threat, the creation nearby of a fresh supply of slash during the flight period of the emerging adults will generally attract the beetles. The slash should be created just as the majority of the population enters the pupal stage. Once this "green chain" is initiated, the technique should be continued for each generation of the season until autumn. The "chain" can then be broken by the slash treatments previously mentioned.

Finally, poorly designed, poorly administered, or harsh and abusive logging operations can create many problems that lead to excessive killing of residual trees. Some methods that may help reduce the risk are:

a. Trees whose roots are exposed or disturbed or that have large patches of bark knocked off should be cut and removed at the end of the operation.

b. Fall trees into openings and use established skid trails to avoid damaging the residual stand. In other words, follow the guidelines presently being developed by Gary Fiddler with the Silvicultural Development Unit at Burney.